The Effect of Reflexology on the Pain-Insomnia-Fatigue Disturbance Cluster of Breast Cancer Patients During Adjuvant Radiation Therapy

Ricardo Tarrasch, PhD;1 Narin N. Carmel-Neiderman, MD;2 Sarah Ben-Ami, MSc;3 Bella Kaufman, MD3 Raphi Pfeffer, MD4 Merav Ben-David, MD4,5 and Dorit Gamus, MD, PhD2

Abstract

Objective: To evaluate the effects of reflexology treatment on quality of life, sleep disturbances, and fatigue in breast cancer patients during radiation therapy.

Methods/Subjects: A total of 72 women with breast cancer (stages 1–3) scheduled for radiation therapy were recruited.

Design: Women were allocated upon their preference either to the group receiving reflexology treatments once a week concurrently with radiotherapy and continued for 10 weeks or to the control group (usual care).

Outcome measures: The Lee Fatigue Scale, General Sleep Disturbance Scale, and Multidimensional Quality of Life Scale Cancer were completed by each patient in both arms at the beginning of the radiation treatment, after 5 weeks, and after 10 weeks of reflexology treatment.

Results: The final analysis included 58 women. The reflexology treated group demonstrated statistically significant lower levels of fatigue after 5 weeks of radiation therapy ($p<0.001$), compared to the control group. It was also detected that although the quality of life in the control group deteriorated after 5 and 10 weeks of radiation therapy ($p<0.01$ and $p<0.05$, respectively), it was preserved in the reflexology group, which also demonstrated a significant improvement in the quality of sleep after 10 weeks of radiation treatment ($p<0.05$). Similar patterns were obtained in the assessment of the pain levels experienced by the patients.

Conclusions: The results of the present study indicate that reflexology may have a positive effect on fatigue, quality of sleep, pain, and quality of life in breast cancer patients during radiation therapy. Reflexology prevented the decline in quality of life and significantly ameliorated the fatigue and quality of sleep of these patients. An encouraging trend was also noted in amelioration of pain levels.

Keywords: reflexology, radiation therapy, fatigue, breast cancer

Introduction

Cancer-related fatigue (CRF) is one of the most common side-effects among breast cancer patients during adjuvant radiation treatment.1 It is estimated that about 80% of the patients undergoing radiation treatment suffer from fatigue,2 with a resultant decrease in quality of life (QOL). In addition to fatigue, patients undergoing radiotherapy often experience poor sleep quality, which by itself might be
a risk factor for CRF. It has been reported that patients with breast cancer experience sleep disturbance more frequently and with a greater severity than patients with prostate cancer, although both populations report poor sleep quality and fatigue.3

The pain-insomnia-fatigue symptom cluster is one of the clusters (co-occurrence of symptoms) found in breast cancer patients during radiation treatment7 and if not adequately managed, may affect mood, role performance, social functions, ability to tolerate and continue cancer therapies, and overall QOL.5,6 It has been suggested therefore that these symptoms should be addressed as part of comprehensive cancer care.

While there are limited pharmacologic interventions for CRF,7 several nonpharmacologic approaches have demonstrated encouraging results such as exercise8,9 and psychologic interventions.10

Complementary and alternative medicine (CAM) therapies are gradually gaining more interest in cancer symptom management.11 More than 50% of cancer patients in Israel use complementary medicine.12 There is evidence for the benefits of massage for symptom management of cancer patients. A systematic review and meta-analysis that evaluated the effect of massage interventions on treatment-related side-effects of breast cancer patients demonstrated that regular use of massage led to significantly greater reductions in anger and fatigue symptoms.13 A prospective multicenter study of CAM utilization among breast cancer patients during radiation treatment demonstrated that massage and reflexology comprised almost 40% of all CAM practices.14 In another study 40.1% of the women treated for primary breast cancer reported the use of CAM, reflexology being the fifth most common method of treatment, and the leading of the massage therapies group.15

Reflexology is also known as “zone therapy” and involves manual stimulation of reflex points on the feet that somatotopically correspond to specific areas and organs of the body. It is based on the theory that all organs are represented by various points on the feet, forming a map of the whole body, and that massaging specific areas of feet can affect corresponding target organs.

Clinical experience indicated that reflexology might alleviate fatigue and sleep disturbances. The aim of this study was therefore to evaluate the effect of reflexology on fatigue, pain, and QOL in women with breast cancer during adjuvant radiation therapy.

**Methods**

**Subjects**

The study included 72 breast cancer patients scheduled for adjuvant radiation therapy for 6 consecutive weeks, 5 days a week. Participants were recruited to the experimental or control groups according to their preference. All patients signed informed consent. Exclusion criteria included the following: coagulation disorders and concurrent CAM treatments outside the framework of this study.

Reflexology treatments were administered once a week by a qualified therapist, began concurrently with radiation therapy, and continued for 10 weeks (for up to 4 weeks after the completion of radiation treatments).

Reflexology treatments were provided by a senior reflexologist, who graduated a 3-year course in one of the colleges accredited by the Israeli Reflexology Association, with 13 years of clinical experience. Treatment sessions followed a structured protocol and included a standardized protocol (20 min) of manipulation of the areas, which represent body organs on plantar areas of the feet using systematic massage horizontally and vertically (a crawling method), and massaging of spleen, stomach, and heart areas in a circular clockwise motion. This protocol was followed by an additional 10 min of individualized approach adapted to each patient, according to her current symptoms and involved manipulations of plantar and dorsal areas of the feet.

The control group received no additional treatment.

Fatigue, pain, QOL, and quality of sleep in both groups were assessed by self-reported questionnaires at week 1 (as baseline), week 5, and week 10.

All treatments were delivered at the Cancer Center of the Sheba Medical Center. The study was approved by the local Human Subject Review Board and registered at the ClinicalTrials.gov NCT00825682.

**Tools**

Pain, fatigue, and depression are subjective phenomena that are usually assessed by self-reported questionnaires and, therefore, lack an objective evaluation. To minimize the inherent bias, a pain-insomnia-fatigue cluster that has been characterized by Pud et al. was evaluated, who also demonstrated that differences in functional status and QOL based on different symptom experiences were not only statistically significant but also clinically significant.6 This cluster analysis is based on the Multidimensional Quality of Life Scale-Cancer questionnaire (MQOLS-CA), the Lee Fatigue Scale (LFS), the General Sleep Disturbance Scale (GSDS), and a numeric rating scale of pain intensity. The Hebrew versions of these questionnaires were used, all translated and validated by Pud et al. as follows:

The LFS16 assesses the degree of fatigue and energy and includes 18 items that describe feelings and behaviors associated with fatigue on a 0–10 Likert scale. The Cronbach’s α internal reliability coefficient of the English version is 0.9617 and of the Hebrew translation is 0.93.6 In the present study the reliability obtained at the three time points ranged between 0.90 and 0.94.

The GSDS18 examines several aspects of sleep disorders and includes 21 items that describe feelings and behaviors associated with sleep and dealing with insomnia during the previous week. It uses a 0 (never) to 7 (every day) Likert scale on questions such as feeling nervous during the day; falling asleep while unplanned; and using sleeping pills. The Cronbach’s α reliability coefficient of its English version is 0.77,19 and its validity and reliability have been established in cancer patients.19 The reported Cronbach’s α internal reliability of the Hebrew version is 0.8.6 In this study, the reliability coefficients obtained at the three time points were 0.71, 0.79, and 0.84, respectively.

The MQOLS-CA20 includes 44 items describing different forms in which the disease may affect patient’s QOL. For each item, subjects are asked to mark the number that best describes their feelings right now, in a Likert scale ranging from 1 (not at all) to 5 (very much). The internal reliability coefficient of its English version is 0.8620 and of the Hebrew version is 0.86.6 In the present study the reliability obtained at the three time points ranged between 0.81, 0.82, and 0.83.
between 0 and 10. Items include feelings of happiness, anxiety levels, how the disease affects social ties, etc. The reliability coefficient of the English version of the questionnaire in different studies ranges between 0.67 and 0.96. The English validation of the questionnaire was based on the correlations with other QOL measures and obtained significant correlations ranging between 0.37 and 0.65. The Cronbach’s α reliability coefficient of the Hebrew version of the questionnaire in different studies ranges between 0.67 and 0.96. The reliability coefficients in this study ranged between 0.90 and 0.93.

The pain assessment was based on the Visual Analogue Pain Scale (a 0–10 scale). Subjects were asked to rate the current pain level, the average pain level during the last week, and the maximal pain level during the last week.

**Statistical analysis**

To test the hypotheses that the experimental group will show a greater reduction in the fatigue index, a greater improvement in the sleep quality index, a greater improvement in the QOL, and reduction in pain compared to the control group, repeated measurements of analyses of variances were conducted with time of measurement as the repeated measurements (three time points) and group as the between-subjects effect. Significant effects were followed by Fisher least significant difference post hoc comparisons.

**Results**

Seventy-two women were recruited to the study as follows: 47 chose to participate in the experimental arm and 25 women chose to participate in the control arm. The majority of the patients who declined participation in the study (reflexology) group did it as they were reluctant to arrive at the hospital on a weekly basis in addition to the already scheduled treatments and checkups.

Ten women, five from each group, did not begin the study. In addition, eight women from the experimental group did not complete all reflexology treatments (Fig. 1). Reasons for dropping out included: not attending the second and/or third treatment due to personal reasons (lack of time, distance from the clinic, etc.). To reduce the bias, a semi-intent-to-treat analysis was performed adding the four cases that dropped after the first measurement/ treatment. For missing observations, “last value carried forward” method was used. Accordingly, the final analysis included 38 women in the experimental group and 20 in the control group.

**Demographic data**

The participant’s age ranged between 31 and 77 years (average = 53.7, SD = 10.8). There was no statistical difference between the two groups ([F(56) = 0.71, p = 0.48]. Most of the women (77.6%) were married, 10.3% lived alone, and 59% had a diagnosis of additional chronic disease (asthma, diabetes, hypertension, hyperthyroidism, and epilepsy). There was no statistical difference in the prevalence of background diseases between the groups (χ² = 1.63; p = 0.20).

The patients in this study were all diagnosed with invasive breast cancer (no ductal carcinoma in situ, stage 0 disease). Locally advanced breast cancer (stage 3) was diagnosed among 14 (29.8%) and 9 (36%) of the women; stage 2—among 19 (40.4%) and 10 (40%); and stage 1—among 14 (29.8%) and 6 (24%) of the women in the treatment and control arms, respectively. There was no statistical difference in cancer stage between the two groups (χ² = 0.39, p = 0.82).

Upon the recruitment to the study no significant differences were observed between the two groups in terms of fatigue levels, quality of sleep, QOL, current pain, average pain, and maximum pain levels during the last week: p-values of the differences between the groups as assessed by t tests for independent samples were 0.62, 0.49, 0.61, 0.25, 0.33, and 0.57, respectively (Table 1).

The analysis of the fatigue scale demonstrated a significant effect of time of measurement [F(2, 110) = 6.77, p = 0.002], and most importantly, a significant interaction [F(2, 110) = 4.50, p = 0.01]. Fatigue levels increased in the control group between the first and second measurement (p < 0.001) and between the second and third measurement (p < 0.05), while no increase in fatigue was observed in the experimental group (Fig. 2).

Figure 3 presents quality of sleep levels measured in both groups at the three time points. A significant interaction between group and time was obtained for the sleep quality measure [F(2, 112) = 3.44, p = 0.04]. The source of the interaction stems from an improved sleep quality in the experimental group, as demonstrated by comparison between the first and the third measures (p = 0.02). No significant effects of time or group were obtained.

FIG. 1. Flow of participants through the trial.

<table>
<thead>
<tr>
<th>Measure</th>
<th>Experimental group</th>
<th>Control group</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fatigue levels</td>
<td>3.92</td>
<td>3.68</td>
</tr>
<tr>
<td>Quality of sleep</td>
<td>2.53</td>
<td>2.35</td>
</tr>
<tr>
<td>Quality of life</td>
<td>4.27</td>
<td>4.09</td>
</tr>
<tr>
<td>Current pain</td>
<td>1.63</td>
<td>0.90</td>
</tr>
<tr>
<td>Average pain</td>
<td>1.95</td>
<td>1.30</td>
</tr>
<tr>
<td>Maximum pain</td>
<td>2.32</td>
<td>1.80</td>
</tr>
</tbody>
</table>

Table 1. Means and Standard Deviations of the Dependent Variables, in the Premasure, Separately for the Experimental and Control Groups
The QOL (Fig. 4) was also assessed in both groups at the three time points and demonstrated a significant interaction between group and time \( F(2, 112) = 4.06, p = 0.02 \). The source of the interaction stems from a significant reduction in the QOL in the control group in the second \( (p = 0.01) \) and third \( (p = 0.03) \) measures. No significant effects of time or group were obtained.

Pain levels throughout the study are presented in Figure 5. There was no significant difference between the groups in the percentage of women who reported suffering from pain at presentation \( \chi^2(1) = 1.63; p = 0.20 \). The analyses of current pain, average pain during the last week, and maximum pain level during the last week yielded significant or marginally significant interactions between group and time \( F(2, 112) = 1.95, p = 0.15; F(2, 112) = 2.31, p = 0.10; \) and \( F(2, 112) = 3.81, p = 0.03 \), respectively.

As can be seen in Figure 5a–c, while no significant differences were observed in the pain measures in the experimental group, there was a significant increase in the current pain level in the control group between the first and the second \( (p = 0.01) \) and the third \( (p = 0.03) \) measurements. The average pain level also rose significantly in the control group between the first and the second measurements \( (p = 0.05) \) and declined between the second and the third measurements \( (p = 0.02) \). A significant increase between the first and the second \( (p = 0.003) \) and the third \( (p = 0.05) \) measurements of the worst pain level was also observed in the control group.

Discussion

The effect of reflexology on the pain-insomnia-fatigue symptom cluster in women with breast cancer was evaluated, who received adjuvant radiation therapy. Postirradiation fatigue may persist for a considerable period of time. Reflexology treatment was continued therefore for 4 weeks after the cessation of radiation treatment, to estimate the effect of reflexology both as a concurrent treatment to radiotherapy (assessed at 5 weeks since the beginning of the study) and as a maintenance treatment after the cessation of radiotherapy (assessed at week 10).

By the end of radiation treatment, significant differences in fatigue, sleep, pain, and QOL were detected between the reflexology and control groups: the control group experienced significantly higher levels of fatigue during radiotherapy, while no increase in fatigue was observed in the reflexology group, which even showed a significant improvement in the quality of sleep. Furthermore, while the QOL in the control group deteriorated after 5 and 10 weeks of radiation therapy, it was virtually unaffected in the reflexology group.

While the mechanism of reflexology is still not clear, it shares a common philosophical background with acupuncture and includes some elements of relaxation and
massages. Sharp et al. evaluated the effect of reflexology and massage versus self-initiated support (SIS) on QOL following surgery for breast cancer. Both reflexology and massage had statistically significant effects on QOL compared to SIS, which were clinically worthwhile for reflexology.21

Findings of this study are in line with conclusions of the review of mind–body treatments for the pain-fatigue-sleep disturbance cluster in cancer patients.22 This review demonstrated that fatigue and sleep disturbances were the most common symptoms improved by mind–body interventions, while relaxation, which is often experienced during reflexology treatment, was reported to improve pain and sleep disturbance. None of the studies however demonstrated concurrent improvement in all three symptoms. A recently published meta-analysis on massage therapy in cancer pain found beneficial effect of massage for relief of cancer pain, while reflexology appeared to be more effective than body or aroma massage.23 A significant difference between the levels of the worst pain between the two groups at the second measurement ($p = 0.003$) was also demonstrated. Although a similar trend was noted for the current pain and the average pain, the differences between the groups did not reach statistical significance. It is possible that a failure to detect a significant difference between the groups stems from a relatively small sample size.

The most impressive result of this study was amelioration of CRF. This finding is in concordance with results of other studies of CAM modalities. A large study found significant improvement in postchemotherapy CRF and in QOL after 6 weeks of acupuncture treatment.24 Iyengar Yoga was reported to improve fatigue in breast cancer survivors,25 and yoga treatment for breast cancer patients provided during radiotherapy period also demonstrated a reduction in fatigue compared with stretching exercise group, but no between-group differences for sleep quality were detected.26 Massage therapy in patients with advanced cancer was found to be superior to simple-touch sessions for immediate pain and mood. However, no significant differences were found between the groups in sustained pain, worst pain, or QOL.27

The inflammatory origin of CRF, probably through activation of pro-inflammatory cytokine network, has been suggested by the review on mechanisms, risk factors, and treatments for CRF.28 It was also demonstrated that increased levels of C-reactive protein and IL-1 receptor antagonist were associated with increase in fatigue both in early breast cancer and in prostate cancer patients undergoing radiotherapy.29 Furthermore, a significant influence of skin erythema on pro-inflammatory cytokines and fatigue in breast cancer patients receiving adjuvant radiation therapy was demonstrated.30

It is of interest to note that some of the CAM interventions that had beneficial effect on CRF such as acupuncture, yoga, and massage have also been reported to exert an anti-inflammatory activity.31–34 The previous study that demonstrated amelioration of multiple sclerosis symptoms by reflexology35 may also indicate that reflexology treatment might have an anti-inflammatory effect.

To the best of our knowledge, this is the first report on the effect of reflexology on pain-insomnia-fatigue cluster in breast cancer patients during adjuvant radiation therapy. The study had several limitations as follows: the patients were allocated to the experimental and control groups according to their preference and not through a randomization procedure. The two groups however were similar at the baseline in terms of demographics, background diseases, the levels of fatigue and sleep disturbances, QOL, or pain. In addition, due to the lack of an active control group, it may be that the choice of participation in the reflexology group has resulted

FIG. 5. Interaction between time of measurement and group on pain level measurements. Current (a), average (b), and strongest (c) pain levels measured in the groups at three time points: (1) at the beginning of the study, (2) after 5 weeks reflexology alongside radiation treatment, and (3) after 10 weeks of reflexology treatment.
in some expectations leading to an inherent bias. The sample size was relatively small, but despite the small statistical power, significant improvements in the reflexology group were able to be demonstrated, compared with the control group.

Conclusions

The results of the present study indicate that reflexology may have a positive effect on fatigue, quality of sleep, pain, and QOL in breast cancer patients.

In view of the fact that inadequate treatment of fatigue may considerably compromise both the QOL of cancer patients and the adherence to treatment protocol, there is a need for the development of interventions for this debilitating symptom. Further randomized controlled studies of nonpharmacologic approaches such as acupuncture, yoga, massage, and reflexology should therefore be encouraged.

Acknowledgment

The authors are grateful to Mrs. Lihi Geva for providing reflexology treatments to the patients.

Author Disclosure Statement

No competing financial interests exist.

References


Address correspondence to:
Dorit Gamus, MD, PhD
Complementary and Integrative Medicine Service
Sheba Medical Center
Ramat-Gan 52621
Israel

E-mail: dorit.gamus@sheba.health.gov.il